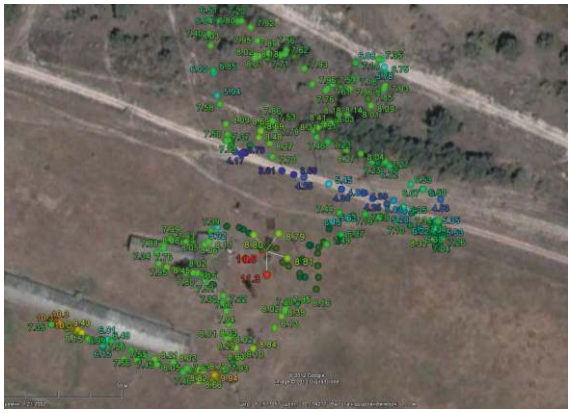
AT6103 Mobile Radiation Scanning System

Mobile system is designed for ground radiation survey and search for gamma and neutron radiation sources with GPS-mapping.

The system can be mounted on a motor vehicle, marine vessel or aircraft carrier with no need for any special tools.

The system need no connection to on-board power of the carrier, though can be controlled and managed by operator as well.



System configuration

- Set of monitors (1 ... 6)
- Tablet PC
- Accessories kit
- Software.

Each monitor has 1 ... 3 integrated detection units.

Number of monitors and detection units in each monitor can be selected by user.

System scalability in terms of monitors allows gamma and neutron radiation response control over a wide range.

Application

- Identification and assessment of land and facility radiation environment from vehicle, helicopter, etc.
- Mapping of radiation levels and density of surface contamination by ^{137}Cs
- Search of lost radioactive sources
- Traffic control of radioactive substances and materials
- Public events radiation safety control
- Detection of radioactive anomalies
- Monitoring of nuclear incident consequences at Nuclear Power Plants
- Discover facts and effects of nuclear weapon testing or use

Features

- User-selectable set of monitors and detection units
- High system scalability in terms of sensitivity to gamma and neutron radiation
- Automatic simultaneous gamma and neutron radiation scanning
- Search and detection of radioactive sources and real-time identification of its isotopic composition
- Automatic accommodation to change of radiation background level
- Simultaneous measurement of gamma radiation spectral distribution and dose rate
- Dosimetric scanning in wide dose rate range of gamma radiation (up to 10 Sv/h); readout conversion to ^{137}Cs surface activity
- Scanning data are constantly recorded for further analysis
- Expert “GARM” software for data processing and analysis
- Built-in GPS receiver with connector for external GPS antenna
- Storage and operation in protective shock-resistant cases

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System functions

- Measurement of gamma radiation energy distribution
- Measurement of gamma radiation dose rate and assessment of density of surface contamination by ^{137}Cs (kBq/m^2, Ci/km^2)
- Count rate measurement of neutron radiation impulses
- Consolidation of measurement information in a single data flow
- Detection of gamma and neutron radiation sources
- Radionuclide identification
- Logging of all measurement results and processing in application software
- Isoline contouring by selected parameter
- All data can be displayed on a terrain map

Operation principle

The system operates in continuous radiation environment scan mode: continuous search, detection, localization and identification of gamma sources; search and discovery of neutron radiation.

The system is controlled by one rugged 10" tablet PC.

All monitors connect to tablet PC by BT-DU3 adapter using wireless channel.

When radioactive source is detected the system activates alarm and identifies its radionuclide composition.

Types of identified radionuclides are displayed on tablet PC screen and operator hears a corresponding voice message in a wireless headset.

Measurement results are continuously transmitted into tablet PC for subsequent processing by PC and can be plotted onto a map using "GARM" application software tools.

“ARMS" application software performs automatic data transfer to a remote server (Over FTP server and if PC has a 3G communication function or can be connected to a Wi-Fi network).

The system provides the user with uniform (consolidated) measurement data regardless of type and number of monitors: Uniform gamma radiation spectrum, uniform flow of instantaneous gamma radiation impulses for detection of radiation source, uniform gamma radiation dose rate and its statistical error.

Main specifications of Mobile Radiation Scanning System	
Available monitors **(Each monitor can contain 1 ... 3 integrated detection units)** **[System configuration can be selected by user]**	**1) Gamma radiation and neutron radiation monitor** [1 – 3 units of BDKG -11M and/or BDKG-19M, 1 – 3 units of BDKN-05, 1 unit of BDKG-04] **2) Highly-sensitive gamma radiation and neutron radiation monitor** [1 – 3 units of BDKG-28 and/or BDKG-34, 1 – 2 units of BDKN-05, 1 unit of BDKG-04] **3) Highly-sensitive gamma radiation and neutron radiation counting monitor** [1 – 2 units of BDRM-05, 1 – 2 units of BDKN-05, 1 unit of BDKG-04]
Total number of detection units in the system	18
Identified radionuclides:	Medical, industrial and natural
Optional:	Library of identified radionuclides can be modified
GPS	GPS receiver is integrated into Tablet PC. Positioning accuracy is ≥3 m
Tablet PC-to-monitors connection	Bluetooth / USB / RS232
Power supply of detection units	BT-DU3 adapter
Charging the battery of BT-DU3 adapter and Tablet PC	1) 230 VAC, 50 Hz mains 2) External source of 12 VDC. The system automatically monitors battery's charge level
Continuous run time	~ 10 h (with lowest brightness of Tablet PC screen)
Protection class	IP65
Mean operating life	≥15 years
Operation temperature range	-20°C to +50°C
Relative air humidity	≤95% (Air temperature ≤35°C without condensation)
Mobile system meets safety standards of IEC 61010-1:2001 and electromagnetic compatibility requirements of: EN 55011:2009, IEC 61000-4-2:2008, IEC 61000-4-3:2008	

Design and specifications are subject to change without notice

Specifications of gamma radiation detection units

Gamma radiation detection unit		BDKG-11M (Spectrometry & Dosimetry)	BDKG-19M (Spectrometry & Dosimetry)	BDKG-28 (Spectrometry & Dosimetry)	BDKG-34 (Spectrometry & Dosimetry)	BDKG-04 (Dosimetry)
Detector		NaI(Tl) scintillator, Ø63x63 mm	NaI(Tl) scintillator, Ø63x160 mm	NaI(Tl) scintillator, 400x100x100 mm	NaI(Tl) scintillator, 400x100x50 mm	Scintillation plastic, Ø30x15 mm
Energy range In spectrometric mode In Dosimetry mode		 20 keV – 3 MeV 50 keV – 3 MeV	 20 keV – 3 MeV 50 keV – 3 MeV	 50 keV – 3 MeV 50 keV – 3 MeV	 50 keV – 3 MeV 50 keV – 3 MeV	 – 15 keV – 3 MeV
Measurement range of gamma radiation ambient dose equivalent rate		0.03 – 150 μSv/h	0.03 – 50 μSv/h	0.03 – 7 μSv/h	0.03 – 10 μSv/h	0.05 μSv/h – 10 Sv/h
Limit of intrinsic relative measurement error		±20%	±20%	±20%	±20%	±20%
Sensitivity to gamma radiation, (cps/μSv·h^{-1})	^{241}Am ^{137}Cs ^{60}Co	13500 2200 1200	37000 6000 2500	130000 33000 19000	118000 26500 15500	370 70 40
Response time for dose rate change from 0.1 to 1 μSv/h		<2 s	<2 s	<2 s	<2 s	<3 s
Typical energy resolution for 662 keV (^{137}Cs)		7.5%	8%	8.5%	8.5%	–
Integral nonlinearity		±1%	±1%	±1%	±1%	–
Number of ADC channels		1024	1024	1024	1024	–
Overall dimensions, weight		Ø78x350 mm, 1.7 kg	Ø76x422 mm, 3 kg	710x108x108 mm, 19 kg	670x108x121 mm, 10.5 kg	Ø60x205 mm, 0.5 kg

Gamma radiation counting detection unit		BDRM-05 (Radiometry)
Detector		Scintillation plastic, 1000x100x50 mm
Energy range		50 keV – 3 MeV
Indication range of gamma radiation impulse count rate		0 – 5·10^5 s^{-1}
Typical sensitivity to gamma radiation, cps/(μSv·h^{-1})	^{241}Am ^{137}Cs ^{60}Co	62000 32000 17000
Overall dimensions, weight		1315x140x100 mm, 12 kg

	Detection unit	BDKG-11M	BDKG-19M	BDKG-28	BDKG-34	BDRM-05
The system in "Search" mode detects gamma radiation source containing ^{137}Cs radionuclide in less than 2 s in the following conditions	Activity of ^{137}Cs source	(450±10) kBq	(300±10) kBq	(105±5) kBq	(105±5) kBq	(100±5) kBq
	Distance from source to detection unit surface	(100.0±0.5) cm				
	Detection probability	95%				
	False alarm rate	≤1 in 10 min				

Specifications of neutron radiation detection units

Neutron radiation detection units		BDKN-05 (Radiometry)
Detector		Two ^{3}He-proportional neutron counters Ø30x360 mm in polyethylene moderator
Energy range		0.025 eV – 14 MeV
Indication range of neutron radiation impulse count rate		0 – 2.5·10^4 s^{-1}
Typical sensitivity to source radiation at the distance of 1 m	Pu-Be ^{252}Cf	8 cps/(neutron·s^{-1}·cm^{-2}) 20 cps/(neutron·s^{-1}·cm^{-2})
Overall dimensions, weight		105x115x380 mm, 3.5 kg

	Detection unit	BDKN-05
The system in "Search" mode detects plutonium-beryllium source of neutron radiation in less than 3 s in the following conditions	Average neutron flux from source to solid angle 4π	(5.00±1.25)·10^4 neutron·s^{-1}
	Distance from source to detection unit surface	(125±1) cm
	Detection probabilit	95%
	False alarm rate	≤1 in 60 min

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System configuration

1 Tablet PC

- **Algiz 10X-PO1**
- **Algiz 10X-PO2 [3G modem]** ***(option)***

(Algiz 10X Tablet PC can be replaced by another Tablet PC with similar specifications)

2 Gamma radiation and neutron radiation monitor (1 – 6 units)

- **BDKG-11M gamma radiation detection unit (1 – 3 units)**
- **BDKG-19M gamma radiation detection unit (1 – 3 units)**
- **BDKN-05 neutron radiation detection unit (1 – 3 units)**
- **BDKG-04 gamma radiation detection unit (1 unit)**
- **BT-DU3 adapter and cables**
- **Operating case**

3 Highly-sensitive gamma radiation and neutron radiation monitor (1 - 6 units)

- **BDKG-28 or BDKG-34 gamma radiation detection unit (1 – 3 units)**
- **BDKN-05 neutron radiation detection unit (1 – 2 units)**
- **BDKG-04 gamma radiation detection unit (1 unit)**
- **BT-DU3 adapter and cables**
- **Operating case**

4 Highly-sensitive gamma radiation and neutron radiation counting monitor: (1 - 6 units)

- **BDRM-05 gamma radiation counting detection unit (1 – 2 units)**
- **BDKN-05 neutron radiation detection unit (1 – 2 units)**
- **BDKG-04 gamma radiation detection unit (1 unit)**
- **BT-DU3 adapter and cables**
- **Operating case**

5 Accessories (option)

- **AC adapter, check sample, USB cable, RS232 cable, wired headphone, wireless headphone, battery of increased capacity for Tablet PC, car charger, car holder, car dock station and external GPS antenna**
- **Operating case**

6 Documentation / Software

- **User's manual**
- **"AT6103" software with Software User's Manual**
- **"GARM" software with Software User's Manual**
- **"ARMS" software with Software User's Manual (option)**

Notes
1) Number and type of system's monitors has to be noted in order 2) The system may comprise only one BDKG-04 detection unit 3) The number of monitors cannot exceed 6 units

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Gamma radiation and neutron radiation monitor:
BDKG-11M (1 unit)
BDKG-04 (1 unit)
BDKG-05 (1 unit)

Accessories

Highly-sensitive gamma radiation and neutron radiation monitor:
BDKG-34 (1 unit), BDKN-05 (2 units)

Highly-sensitive gamma radiation and neutron radiation counting monitor: **BDRM-05 (1 unit), BDKN-05 (2 units)**

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